AIR FORCE
SBIR 09.1 Proposal Submission Instructions

The Air Force (AF) proposal submission instructions are intended to clarify the DoD solicitation instructions as they apply to AF requirements.

The Air Force Research Laboratory, Wright-Patterson Air Force Base, Ohio, is responsible for the implementation and management of the Air Force Small Business Innovation Research (SBIR) Program.

The Air Force SBIR Program Manager is Mr. Steve Guilfoos, 1-800-222-0336. For general inquiries or problems with the electronic submission, contact the DoD Help Desk at 1-866-724-7457 (1-866-SBIRHLP) (8:00 am to 5:00 pm ET). For technical questions about the topic during the pre-solicitation period (12 November 2008 – 7 Dec 08), contact the Topic Authors listed for each topic on the Web site. For information on obtaining answers to your technical questions during the formal solicitation period (8 December 2008 through 14 January 2009), go to **http://www.dodsbir.net/sitis/.**

The Air Force SBIR Program is a mission-oriented program that integrates the needs and requirements of the Air Force through R&D topics that have military and commercial potential.

PHASE I PROPOSAL SUBMISSION

Read the DoD SBIR Program solicitation at www.dodsbir.net/solicitation **for program requirements.** When you prepare your proposal, keep in mind that Phase I should address the feasibility of a solution to the topic. For the Air Force, the contract period of performance for Phase I shall be nine (9) months, and the award shall not exceed $100,000. We will accept only one cost proposal per topic proposal, and it must address the entire nine-month contract period of performance.

The Phase I award winners must accomplish the majority of their primary research during the first six months of the contract. Each Air Force organization may request Phase II proposals prior to the completion of the first six months of the contract based upon an evaluation of the contractor's technical progress and review by the Air Force Technical point of contact utilizing the criteria in section 4.3 of the DoD solicitation. The last three months of the nine-month Phase I contract will provide project continuity for all Phase II award winners so no modification to the Phase I contract should be necessary. **Phase I technical proposals have a 20 page-limit (excluding the cost proposal, cost proposal itemized listing (a–h), and Company Commercialization Report).** The Air Force will evaluate and select Phase I proposals using review criteria based upon technical merit, principal investigator qualifications, and commercialization potential as discussed in this solicitation document.

ALL PROPOSAL SUBMISSIONS TO THE AIR FORCE SBIR PROGRAM MUST BE SUBMITTED ELECTRONICALLY.

Limitations on Length of Proposal

The technical proposal must be no more than 20 pages (no type smaller than 10-point on standard 8-1/2" x 11" paper with 1-inch margins). The Cost Proposal, cost proposal itemized listing (a-h), and Company Commercialization Report are excluded from the 20 page limit. Only the Proposal Cover Sheet (pages 1 and 2), the Technical Proposal (beginning with page 3), and any enclosures or attachments count toward

the 20-page limit. In the interest of equity, pages in excess of the 20-page limitation (including attachments, appendices, or references, but excluding the cost proposal, cost proposal itemized listing (a-h), and Company Commercialization Report) will not be considered for review or award.

Phase I Proposal Format

Proposal Cover Sheets. Your cover sheets will count as the first two pages of your proposal no matter how they print out. If your proposal is selected for award, the technical abstract and discussion of anticipated benefits will be publicly released on the Internet; therefore, do not include proprietary information in these sections.

Technical Proposal

The Technical Proposal should include all graphics and attachments but should not include the Cover Sheet or Company Commercialization Report (as these items are completed separately). Most proposals will be printed out on black and white printers so make sure all graphics are distinguishable in black and white. It is strongly encouraged that you perform a virus check on each submission to avoid complications or delays in submitting your Technical Proposal. To verify that your proposal has been received, click on the "Check Upload" icon to view your proposal. Typically, your uploaded file will be virus checked and converted to PDF within the hour. However, if your proposal does not appear after an hour, please contact the DoD Help Desk at 1-866-724-7457 (8:00 am to 5:00 pm ET).

Key Personnel

Identify in the technical proposal key personnel who will be involved in this project, including information on directly related education and experience. A resume of the principle investigator, including a list of publications, if any, must be included. Resumes of proposed consultants, if any, are also useful. Consultant resumes may be abbreviated. **Please identify any foreign nationals you expect to be involved in this project as a direct employee, subcontractor, or consultant. Please provide resumes, country of origin and an explanation of the individual's involvement.**

Phase I Work Plan Outline

NOTE: PROPRIETARY INFORMATION SHALL NOT BE INCLUDED IN THE WORK PLAN OUTLINE. THE AF WILL USE THIS WORK PLAN OUTLINE AS THE INITIAL DRAFT OF THE PHASE I STATEMENT OF WORK (SOW).

At the beginning of your proposal work plan section, include an outline of the work plan in the following format:

1) Scope
   List the major requirements and specifications of the effort.
2) Task Outline
   Provide a brief outline of the work to be accomplished over the span of the Phase I effort.

3) Milestone Schedule
4) Deliverables
    a. Kickoff meeting within 30 days of contract start
    b. Progress reports
    c. Technical review within 6 months
    d. Final report with SF 298

Cost Proposal

Cost proposal information should be provided by completing the on-line Cost Proposal form and including the cost proposal itemized listing (a-h) specified below. The cost proposal information must be at a level of detail that would enable Air Force personnel to determine the purpose, necessity and reasonability of each cost element. Provide sufficient information (a through h below) on how funds will be used if the contract is awarded. The on-line cost proposal and itemized cost proposal information (a-h) will not count against the 20 page limit. The itemized listing may be placed in the "Explanatory Material" section of the on-line Cost Proposal form (if enough room), or as the last page(s) of the Technical Proposal Upload. (Note: Only one file can be uploaded to the DoD Submission Site). Ensure that this file includes your complete Technical Proposal and the cost proposal itemized listing (a-h) information.

a. Special Tooling and Test Equipment and Material: The inclusion of equipment and materials will be carefully reviewed relative to need and appropriateness of the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the government and relate directly to the specific effort. They may include such items as innovative instrumentation and/or automatic test equipment.

b. Direct Cost Materials: Justify costs for materials, parts, and supplies with an itemized list containing types, quantities, and price and, where appropriate, purposes.

c. Other Direct Costs: This category of costs includes specialized services such as machining or milling, special testing or analysis, costs incurred in obtaining temporary use of specialized equipment. Proposals which include leased hardware must provide an adequate lease vs. purchase justification or rational.

d. Direct Labor: Identify key personnel by name if possible or by labor category if specific names are not available. The number of hours, labor overhead and/or fringe benefits and actual hourly rates for each individual are also necessary.

e. Travel: Travel costs must relate to the needs of the project. Break out travel cost by trip, with the number of travelers, airfare, per diem, lodging, etc., and the number of trips required, as well as the destination and purpose of each trip. The Air Force recommends budgeting at least one (1) trip to the Air Force location managing the contract.

f. Cost Sharing: Cost sharing is permitted. However, cost sharing is not required, nor will it be an evaluation factor in the consideration of a proposal. Please note that cost share contracts do not allow fees.

g. Subcontracts: Involvement of university or other consultants in the planning and/or research stages of the project may be appropriate. If the offeror intends such involvement, described in detail and include information in the cost proposal. The proposed total of all consultant fees, facility leases or usage fees and

other subcontract or purchase agreements may not exceed one-third of the total contract price or cost, unless otherwise approved in writing by the contracting officer.

(NOTE): The Small Business Administration has issued the following guidance:

"Agencies participating in the SBIR Program will not issue SBIR contracts to small business firms that include provisions for subcontracting any portion of that contract award back to the originating agency or any other Federal Government agency." See Section 2.6 of the DoD SBIR Program solicitation for more details.

Support subcontract costs with copies of the subcontract agreements. The supporting agreement documents must adequately describe the work to be performed (i.e. cost proposal). At the very least, provide a statement of work with a corresponding detailed cost proposal for each planned subcontract.

h. Consultants: Provide a separate agreement letter for each consultant. The letter should briefly state what service or assistance will be provided, the number of hours required and hourly rate.

PHASE I PROPOSAL SUBMISSION CHECKLIST

Failure to meet any of the criteria will result in your proposal being **REJECTED,** and the Air Force will not evaluate your proposal.

1) The Air Force Phase I proposal shall be a nine month effort and the cost shall not exceed $100,000.

2) The Air Force will accept only those proposals submitted electronically via the DoD SBIR Web site (www.dodsbir.net/submission).

3) You must submit your Company Commercialization Report electronically via the DoD SBIR Web site (www.dodsbir.net/submission).

It is mandatory that the complete proposal submission -- DoD Proposal Cover Sheet, Technical Proposal with any appendices, Cost Proposal, and the Company Commercialization Report -- be submitted electronically through the DoD SBIR Web site at http://www.dodsbir.net/submission. Each of these documents is to be submitted separately through the Web site. Your complete proposal **must** be submitted via the submissions site on or before the **6:00 am ET, 14 January 2009 deadline.** A hardcopy **will not** be accepted. Signatures are not required at proposal submission when submitting electronically. If you have any questions or problems with electronic submission, contact the DoD SBIR Help Desk at 1-866-724-7457 (8:00 am to 5:00 pm ET).

The Air Force recommends that you complete your submission early, as computer traffic gets heavy near the solicitation closing and could slow down the system. **Do not wait until the last minute.** The Air Force will not be responsible for proposals being denied due to servers being "down" or inaccessible. Please assure that your e-mail address listed in your proposal is current and accurate. By the end of January, you will receive an e-mail serving as our acknowledgement that we have received your proposal. The Air Force is not responsible for notifying companies that change their mailing address, their e-mail address, or company official after proposal submission.

AIR FORCE SBIR/STTR VIRTUAL SHOPPING MALL

As a means of drawing greater attention to SBIR accomplishments, the Air Force has developed a Virtual Shopping Mall at http://www.sbirsttrmall.com. Along with being an information resource concerning SBIR policies and procedures, the Shopping Mall is designed to help facilitate the Phase III transition process. In this regard, the Shopping Mall features: (a) SBIR Impact / Success Stories written by the Air Force; and (b) Phase I and Phase II summary reports that are written and submitted by SBIR companies. Since summary reports are intended for public viewing via the Internet, they should not contain classified, sensitive, or proprietary information. Submission of a Phase I Final Summary Report is a mandatory requirement for any company awarded a Phase I contract in response to this solicitation.

AIR FORCE PROPOSAL EVALUATIONS

Evaluation of the primary research effort and the proposal will be based on the scientific review criteria factors (i.e., technical merit, principal investigator (and team), and commercialization plan). Please note that where technical evaluations are essentially equal in merit, and as cost and/or price is a substantial factor, cost to the government will be considered in determining the successful offeror. The Air Force anticipates that pricing will be based on adequate price competition. The next tie-breaker on essentially equal proposals will be the inclusion of manufacturing technology considerations.

The Air Force will utilize the Phase I evaluation criteria in section 4.2 of the DoD solicitation in descending order of importance with technical merit being most important, followed by the qualifications of the principal investigator (and team), and followed by commercialization plan. The Air Force will use the phase II evaluation criteria in section 4.3 of the DoD solicitation with technical merit being most important, followed by the commercialization plan, and then qualifications of the principal investigator (and team).

NOTICE: Only government personnel and technical personnel from Federally Funded Research and Development Centers (FFRDCs), Mitre Corporation and Aerospace Corporation, working under contract to provide technical support to Air Force product centers (Electronic Systems Center and Space and Missiles Center respectively), may evaluate proposals. All FFRDC employees at the product centers have non-disclosure requirements as part of their contracts with the centers. In addition, Air Force support contractors may be used to administratively process or monitor contract performance and testing. Contractors receiving awards where support contractors will be utilized for performance monitoring may be required to execute separate non-disclosure agreements with the support contractors.

On-Line Proposal Status and Debriefings

The Air Force has implemented on-line proposal status updates and debriefings (for proposals not selected for an Air Force award) for small businesses submitting proposals against Air Force topics. At the close of the Phase I Solicitation – and following the submission of a Phase II via the DoD SBIR/STTR Submission Site (https://www.dodsbir.net/submission) – small business can track the progress of their proposal submission by logging into the Small Business Area of the Air Force SBIR/STTR Virtual Shopping Mall (http://www.sbirsttrmall.com). The Small Business Area

(http://www.sbirsttrmall.com/Firm/login.aspx) is password protected and firms can view their information only.

To receive a status update of a proposal submission, click the "Proposal Status/Debriefings" link at the top of the page in the Small Business Area (after logging in). A listing of proposal submissions to the Air Force within the last 12 months is displayed. Status update intervals are: Proposal Received, Evaluation Started, Evaluation Completed, Selection Started, and Selection Completed. A date will be displayed in the appropriate column indicating when this stage has been completed. If no date is present, the proposal submission has not completed this stage. Small businesses are encouraged to check this site often as it is updated in real-time and provides the most up-to-date information available for all proposal submissions**. Once the "Selection Completed" date is visible, it could still be a few weeks (or more) before you are contacted by the Air Force with a notification of selection or non-selection.** The Air Force receives thousands of proposals during each solicitation and the notification process requires specific steps to be completed prior to a Contracting Officer distributing this information to small business.

The Principal Investigator (PI) and Corporate Official (CO) indicated on the Proposal Coversheet will be notified by e-mail regarding proposal selection or non-selection. The e-mail will include a link to a secure Internet page to be accessed which contains the appropriate information. If your proposal is tentatively selected to receive an Air Force award, the PI and CO will receive a single notification. If your proposal is not selected for an Air Force award, the PI and CO may receive up to two messages. The first message will notify the small business that the proposal has not been selected for an Air Force award and provide information regarding the availability of a proposal debriefing. The notification will either indicate that the debriefing is ready for review and include instructions to proceed to the "Proposal Status/Debriefings" area of the Air Force SBIR/STTR Virtual Shopping Mall, or it may state that the debriefing is not currently available but generally will be within 90 days (due to unforeseen circumstances, some debriefings may be delayed beyond the nominal 90 days). If the initial notification indicates the debriefing will be available generally within 90 days, the PI and CO will receive a follow-up notification once the debriefing is available on - line. All proposals not selected for an Air Force award will have an on-line debriefing available for review. Available debriefings can be viewed by clicking on the "Debriefing" link, located on the right of the Proposal Title, in the "Proposal Status/Debriefings" section of the Small Business Area of the Air Force SBIR / STTR Virtual Shopping Mall**. Small Businesses will receive a notification for each proposal submitted. Please read each notification carefully and note the proposal number and topic number referenced. Also observe the status of the debriefing as availability may differ between submissions (e.g., one may state the debriefing is currently available while another may indicate the debriefing will be available within 90 days).**

IMPORTANT: Proposals submitted to the Air Force are received and evaluated by different offices within the Air Force and handled on a topic-by-topic basis. Each office operates within their own schedule for proposal evaluation and selection**. Updates and notification timeframes will vary by office and topic. If your company is contacted regarding a proposal submission, it is not necessary to contact the Air Force to inquire about additional submissions.** Check the Small Business Area of the Air Force SBIR/STTR Virtual Shopping Mall for a current update. Additional notifications regarding your other submissions will be forthcoming.

We anticipate having all the proposals evaluated and our Phase I contract decisions within approximately four months of proposal receipt. **All questions concerning the status of a proposal, or debriefing, should be directed to the local awarding organization SBIR Program Manager.** Organizations and their Topic numbers are listed later in this section (before the Air Force Topic descriptions).

PHASE II PROPOSAL SUBMISSIONS

Phase II is the demonstration of the technology that was found feasible in Phase I. Only those Phase I awardees that are **invited** to submit a Phase II proposal and all FAST TRACK applicants will be eligible to submit a Phase II proposal. The awarding Air Force organization will send detailed Phase II proposal instructions to the appropriate small businesses. Phase II efforts are typically two (2) years in duration and do not exceed $750,000. (Note: All Phase II awardees must have a Defense Contract Audit Agency (DCAA) approved accounting system**. Get your DCAA accounting system in place prior to the AF Phase II award timeframe. If you do not have a DCAA approved accounting system this will delay/prevent Phase II contract award. If you have questions regarding this matter, please discuss with your Phase I contracting officer.**

All proposals must be submitted electronically at www.dodsbir.net/submission. The complete proposal -- Department of Defense (DoD) cover sheet, entire technical proposal with appendices, cost proposal and the Company Commercialization Report – must be submitted by the date indicated in the invitation. The technical proposal is **limited to 50 pages** (unless a different number is specified in the invitation). The commercialization report, any advocacy letters, SBIR Environment Safety and Occupational Health (ESOH) Questionnaire, and cost proposal itemized listing (a through h) will not count against the 50-page limitation and should be placed as the last pages of the Technical Proposal file that is uploaded. (Note: Only one file can be uploaded to the DoD Submission Site. Ensure that this single file includes your complete Technical Proposal and the additional cost proposal information.) The preferred format for submission of proposals is Portable Document Format (PDF). Graphics must be distinguishable in black and white. **Please virus check your submissions**.

FAST TRACK

Detailed instructions on the Air Force Phase II SBIR Program and notification of the opportunity to submit a FAST TRACK application will be forwarded with all AF Phase I selection e-mail notifications. The Air Force encourages businesses to consider a FAST TRACK application when they can attract outside funding and the technology is mature enough to be ready for application following successful completion of the Phase II contract.

NOTE:

1) Fast Track applications must be submitted not later than 150 days after the start of the Phase I contract.
2) Fast Track phase II proposals must be submitted not later than 180 days after the start of the Phase I contract.
3) The Air Force does not provide interim funding for Fast Track applications. If selected for a phase II award, we will match only the outside funding for Phase II.

For FAST TRACK applicants, should the outside funding not become available by the time designated by the awarding Air Force activity, the offeror will not be considered for any Phase II award. FAST TRACK applicants may submit a Phase II proposal prior to receiving a formal invitation letter. The Air Force will select Phase II winners based solely upon the merits of the proposal submitted, including FAST TRACK applicants.

AIR FORCE PHASE II ENHANCEMENT PROGRAM

On active Phase II awards, the Air Force will select a limited number of Phase II awardees for the Enhancement Program to address new unforeseen technology barriers that were discovered during the Phase II work. The selected enhancements will extend the existing Phase II contract award for up to one year and the Air Force will match dollar-for-dollar up to $500,000 of non-SBIR government matching

funds. Contact the local awarding organization SBIR Manager for more information. (See Air Force SBIR Organization Listing.) If selected for a Phase II enhancement, the company must submit a Phase II Enhancement application through the DoD Submission Web site at www.dodsbir.net/submission.

AIR FORCE SBIR PROGRAM MANAGEMENT IMPROVEMENTS

The Air Force reserves the right to modify the Phase II submission requirements. Should the requirements change, all Phase I awardees that are invited to submit Phase II proposals will be notified. The Air Force also reserves the right to change any administrative procedures at any time that will improve management of the Air Force SBIR Program.

PHASE I SUMMARY REPORTS

In addition to all the Phase I contractual deliverables, Phase I award winners must submit a Phase I Final Summary Report at the end of their Phase I project. The Phase I summary report is an unclassified, non-sensitive, and non-proprietary summation of Phase I results that is intended for public viewing on the Air Force SBIR/STTR Virtual Shopping Mall. A summary report should not exceed 700 words, and should include the technology description and anticipated applications/benefits for government and/or private sector use. It should require minimal work from the contractor because most of this information is required in the final technical report. The Phase I summary report shall be submitted in accordance with the format and instructions posted on the Virtual Shopping Mall Web site at http://www.sbirsttrmall.com.

AIR FORCE SUBMISSION OF FINAL REPORTS

All final reports will be submitted to the awarding Air Force organization in accordance with the Contract. Companies **will not** submit final reports directly to the Defense Technical Information Center (DTIC).

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SPECIAL INSTRUCTIONS

For Air Force Manufacturing SBIR Topics:

These special instructions apply only to topics AF091C-001 and AF091C-002 and are in addition to the regular instructions listed at the beginning of the Air Force section of the solicitation.

These are Manufacturing SBIR topics. The primary focus of Phase I of this effort is to demonstrate the feasibility of developing, integrating and transitioning innovative manufacturing process technologies to support the production of DoD weapon system(s). In addition to demonstrating the proposed technology solution, successful offerors should also consider the technical, business and transition plans necessary to lower the risk of technology insertion into the targeted manufacturing/inspection processes of a DoD weapon system Production floor.

The Air Force plans on awarding multiple Phase I contracts on this topic. Each Phase I contract will be limited to $100,000. These Phase I contract awards will be normal nine (9) month efforts with six (6) months planned for the technical effort and an additional three months allowed for reporting. The Air Force plans on awarding one Phase II contract worth up to $5 Million and lasting for 24 months. Phase II proposals will be by invitation only. At that time, special instructions will be provided for the Phase II proposals.

Successful offerors may also benefit from consideration of technical as well as manufacturing and business readiness levels when preparing responses to Manufacturing SBIR topics. Guidance and information on these three readiness measures can be found in the SBIR Mall Web site located at http://sbirsttrmall.com/Library/Default.aspx. Identification of the return on investment (ROI) through a quantitative cost analysis should be addressed since this SBIR stresses the production implementation developed technologies over existing baseline capabilities.

Air Force SBIR Program Manager Listing

Topic Number	Activity	Program Manager	Contracting Authority (for contract questions only)
AF091C-001 – AF091C-002	Materials & Mfg. Directorate AFRL / RX 2977 Hobson Way, Rm 406 Wright-Patterson AFB OH 45433	Debbie Shaw (937) 255-4839	Kim Yoder (937) 255-4628

Air Force SBIR 091 Topic Index

AF091C-001 TITLE: Affordable Accurate Robot Guidance (AARG)

TECHNOLOGY AREAS: Air Platform, Ground/Sea Vehicles, Materials/Processes

OBJECTIVE: Develop innovative, low-cost metrology/positional-control solutions for high-accuracy robotic drilling systems employing multiple robots simultaneously for static positional work operation.

DESCRIPTION: The initial focus of this solicitation is for the development and demonstration of affordable, accurate robotic guidance solutions integrated into existing multi-robot work stations for use in unconfined, open spaces for application in a military aircraft production line.

The Air Force is seeking to encourage the expansion of manufacturing capacity via robotic manufacturing systems for military aircraft and related applications. A current opportunity is for a manufacturing system capable of accurately guiding and positioning multiple robots in unconfined, open spaces for the purpose of precision drilling of aerospace structures such as a military wing box and/or military forward fuselage assemblies. While this topic focuses on the development and validation of the affordable, accurate robotic guidance technologies, it is anticipated that these guidance technologies will be integrated and demonstrated in a prototype production representative cell incorporating the following additional exiting elements: multiple robots; drill end-effectors; cutting tools; and an automatic tool changer. Some development of these elements may be necessary to affect the overall solution integration and transition. The application of interest requires demonstrating and validating a production system capable of drilling holes in large aero structures to a process capable True Position (TP) of 0.014 inches (as defined in ASME Y14.5M-1994). Special consideration will be given to solutions that achieve TP 0.010 inches or less. The application of interest also requires that such a production system will retain this accuracy throughout the life of a typical aerospace program. The system should be capable of drilling and countersinking through various stacks of graphite epoxy composites, aluminum, titanium, stainless steel, and inconel materials in unconfined, open spaces. Current commercial articulated arm robots, with the required payload, cannot achieve required military aircraft positional accuracies. The final system will include affordable metrology systems for hole/countersink inspection, robot positional accuracy enhancement, and actual part adjustment.

PHASE I: Develop and demonstrate (to MRL 4) the feasibility of affordably and accurately guiding multiple robotic components as described above. ID baseline capabilities and develop a complete system definition that will meet the production needs of a military wing box and/or forward fuselage.

PHASE II: Fully develop and demonstrate the proposed Phase I component technologies within an integrated drilling cell capable of initial pilot production capability (to MRL 7). Implement manufacturing improvements identified in the Phase I effort. Conduct a baseline capability demonstration with multiple robots in the designed military production prototype cell and document initial process capability.

PHASE III / DUAL USE: Military application: Current aircraft acquisition programs in late SDD or entering LRIP/FRP othere military programs Commercial application: Accurate, open space operation of robotic systems have extensive use in industry. Robots are used in auto manufacturing, security, HAZMAT handling, fire fighting, EOD, medical, etc.

REFERENCES:
1. MRL Manufacturing SBIR Tutorial. http://sbirsttrmall.com/Library/Default.aspx.

2. MRL Desk Book. https://acc.dau.mil/CommunityBrowser.aspx?id=182129.
Note: this is non-secure access website

KEYWORDS: assembly, manufacturing, robot guidance, robotic hole drilling, robot metrology

AF091C-002 TITLE: Electron-Beam Additive Manufacturing Process Control for Titanium Alloys

TECHNOLOGY AREAS: Materials/Processes

OBJECTIVE: Develop and validate an electron-beam additive manufacturing (EBAM) process for titanium alloys suitable for the manufacture of production quality aircraft parts.

DESCRIPTION: Titanium forgings are high cost and long lead time items which negatively impact aircraft manufacturing costs and cycle times. Additive manufacturing of titanium structural parts has the potential to reduce lead and cycle times, work in process, and the amount of titanium required to produce structural parts. Additionally, additive manufacturing can be used to fabricate or repair components/spares in small production runs and to produce prototypes where tooling or conventional manufacturing costs would be prohibitive. The focus of this effort will be to develop and demonstrate advanced electron beam additive manufacturing (eBAM) techniques and control processes to produce flight worthy titanium alloy structural aerospace components typically used in DoD aerospace production programs. Special emphasis will be given to the demonstration of the sensors and systems necessary for closed loop control of the deposition parameters, critical to the quality of the component. Additionally, development of a detailed business case is required to show that the optimized eBAM solutions are competitive with existing titanium forging processes in term of cost, quality, lead and cycle times, WIP, etc.

PHASE I: Develop and demonstrate the feasibility (to MRL 4) of using eBAM processes as described above. Deliverables: A manufacturing process development plan with progress and completion performance goals and transition plan to a production partner.

PHASE II: Scale-up, optimize and demonstrate, using production representative components, the eBAM solution developed in Phase I for production of titanium alloy aircraft parts. This includes all heat treating, inspection, and other special processes required to insure that electron-beam additive parts are equivalent to or better than forged parts and can be produced at similar or better rates.

PHASE III / DUAL USE: Military application: DoD systems with titanium alloy, non-flight critical, structural components. Commercial application: Commercial consumers of titanium forgings and castings.

REFERENCES:
1. MRL Manufacturing SBIR Tutorial. http://sbirsttrmall.com/Library/Default.aspx.

2. MRL Desk Book. https://acc.dau.mil/CommunityBrowser.aspx?id=182129.
Note: this is non-secure access website

KEYWORDS: additive manufacturing, electron-beam welding, titanium alloys